

What is claimed is:

1. A process for preparing halogen-containing silanes of the general formula (I):

5



where

10 R is a substituted or unsubstituted alkyl or aryl radical having from 1 to 10 carbon atoms of which one or more may be replaced by -CO-, -CO₂-, -O-, -S-, -SO-, -SO₂-, -NH- or -NR'-, where R' is a substituted or unsubstituted alkyl radical having from 1 to 20 carbon atoms,

15 X is fluorine, chlorine or bromine,

a is an integer of 0, 1, 2 or 3,

b is an integer of 0, 1, 2 or 3 and

c is an integer of 1, 2, 3 or 4,

20 with the proviso that the sum of $a + b + c = 4$, characterized in that silicon, under the action of microwave energy, is reacted with mixtures of the elements or compounds selected from the group consisting of halogens or halogens and organohalogen compounds or halogens and hydrogen
25 or halogens and hydrogen halides or organohalogen compounds or organohalogen compounds and hydrogen or organohalogen compounds and hydrogen halide or hydrogen halides or fluorosilanes and hydrogen or fluorosilanes and hydrogen halide or hydrogen-
30 containing chlorosilanes and hydrogen or hydrogen-containing chlorosilanes and hydrogen halides or organohalosilanes and hydrogen or organohalosilanes and hydrogen halides or hydrocarbons and hydrogen halides.

2. The process of claim 1, characterized in that silicon is contacted with a gas atmosphere of a halogen or of a halogen compound and exposed to microwave energy.
- 5 3. The process of claim 1 or 2, characterized in that crystalline, especially coarsely crystalline, silicon is used.
- 10 4. The process of claim 1 or 2, characterized in that amorphous silicon is used.
5. The process of claim 4, characterized in that amorphous silicon is used in a mixture with crystalline silicon.
- 15 6. The process of at least one of claims 1 to 5, characterized in that silicon is used in conjunction with a catalyst or promoter.
- 20 7. The process of at least one of claims 1 to 6, characterized in that silicon is used in conjunction with a substance which absorbs microwave energy and transfers thermal energy to silicon.
- 25 8. The process of at least one of claims 1 to 7, characterized in that hydrogen halide is used.
- 30 9. The process of at least one of claims 1 to 8, characterized in that the catalyst or promoter used is a metal or metal compound, especially Cu.
- 35 10. The process of at least one of claims 1 to 9, characterized in that nonpulsed microwave energy

is used.

11. The process of at least one of claims 1 to 10,
characterized in that silicon having a particle
5 size of $> 70 \mu\text{m}$ is used.
12. The process of at least one of claims 1 to 11,
characterized in that the halogen compound used is
an organohalogen compound, in particular alkyl or
10 aryl halides, especially methyl chloride.
13. The process of at least one of claims 1 to 12,
characterized in that the silicon used is a
silicon alloy, especially ferrosilicon.
- 15 14. The process of claim 1, characterized in that
compounds of the $\text{F}_n\text{SiH}_{4-n}$ type where $n = 1-3$ are
prepared by contacting elemental silicon under
microwave excitation with mixtures of
20 fluorosilanes with hydrogen or hydrogen fluoride
or hydrogen and hydrogen fluoride.
- 15 15. The process of claim 14, characterized in that
compounds of the $\text{F}_n\text{SiH}_{4-n}$ type where $n = 1-3$ are
25 prepared by contacting elemental silicon under
microwave excitation with mixtures of SiF_4 gas
with hydrogen or hydrogen fluoride or hydrogen and
hydrogen fluoride.
- 30 16. The process of claim 1, characterized in that
compounds of the $\text{Cl}_n\text{SiH}_{4-n}$ type where $n = 1-3$ are
prepared by contacting elemental silicon under
microwave excitation with mixtures of hydrogen-
35 containing chlorosilanes with hydrogen or hydrogen
chloride or hydrogen and hydrogen chloride.

17. The process of at least one of claims 14 to 16,
characterized in that a mixture of different
compounds of the $X_n\text{SiH}_{4-n}$ type where X is fluorine
or chlorine is prepared.
18. The process of claim 17, characterized in that the
mixture is separated by low-temperature
distillation (condensation) or liquid
distillation.
19. The process of any of claims 14 to 18,
characterized in that the degree of hydrogenation
is regulated by varying the hydrogen or hydrogen
halide or the gas pressure of the hydrogen and
~~halogen water~~ *hydrogen halide*.
20. The process of at least one of claims 14 to 19,
characterized in that the $X_n\text{SiH}_{4-n}$ compounds
obtained where X is fluorine or chlorine are
decomposed pyrolytically to obtain highly pure
silicon.
21. The process of claim 20, characterized in that the
gases formed in the course of the pyrolytic
decomposition are recycled back into the system
for the purposes of recycling or reused directly
to synthesize SiX_4 where X is fluorine or
chlorine.
22. The process of claim 1, characterized in that
elemental silicon is contacted under microwave
excitation with mixtures of organohalogen
compounds with hydrogen or hydrogen halide or

hydrogen and hydrogen halide.

23. The process of claim 1, characterized in that the hydrocarbon used is methane or ethane.